

State and Private Lands Forest Inventory Update

Forest Stewardship Coordinating Committee
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3 Different Programs

- **FIA**
 - Partially federally funded
 - Covers entire state
 - Covers all ownerships
 - 1 plot/6,000 acres
 - Data updated annually
 - Comprehensive report every 5 years
- **All 3 programs currently on a 5 year plot remeasurement cycle**
- **CFI Properties**
 - State forest properties
 - 1 plot/40 acres
 - First 5 year cycle completed
 - Comprehensive report “hot off the press”
- **CFI Classified Forests**
 - Private lands in classified forest program
 - 1 plot/200 acres
 - Second year of plot establishment

IN DNR State Forest Properties Report of Continuous Forest Inventory (CFI) Summary of years 1 - 5 (2008-2012)

- **Based on a sample of 3,860 plots**
- **Quantitative and qualitative measurements**
- **The goal of the first five years was to:**
 - **Install/measure all of the plots**
 - **Produce baseline resource estimates**
- **These baseline data/estimates will then be used as a monitoring baseline to compare to future remeasurement data in compilation of statistical change estimates (e.g., tree growth/mortality)**

Highlights of Report

- **155,725 total acres; 149,727 forested acres with the balance in non-forest (i.e. campgrounds) and water**
- **95% of the forested acres are hardwoods**
- **95% of the forested acres are sawlog-sized stands**
- **Forests contain 59.4 million live trees**
- **Sugar Maple trees and seedlings are more abundant than any other species**
- **337.4 million cubic feet of total live tree volume**

Highlights of Report

- **337.4 million cubic feet of total live tree volume**
- **1.379 billion board feet Doyle of sawlog volume**
- **White Oaks followed by Red Oaks are the species groups with the most sawlog volume**
- **Nearly half of the sawlog volume is considered grade 1 or 2**
- **Growth exceeds harvest by at least a 2:1 margin**
- **Multiflora rose, Japanese honeysuckle, and stiltgrass are the most common invasive species**

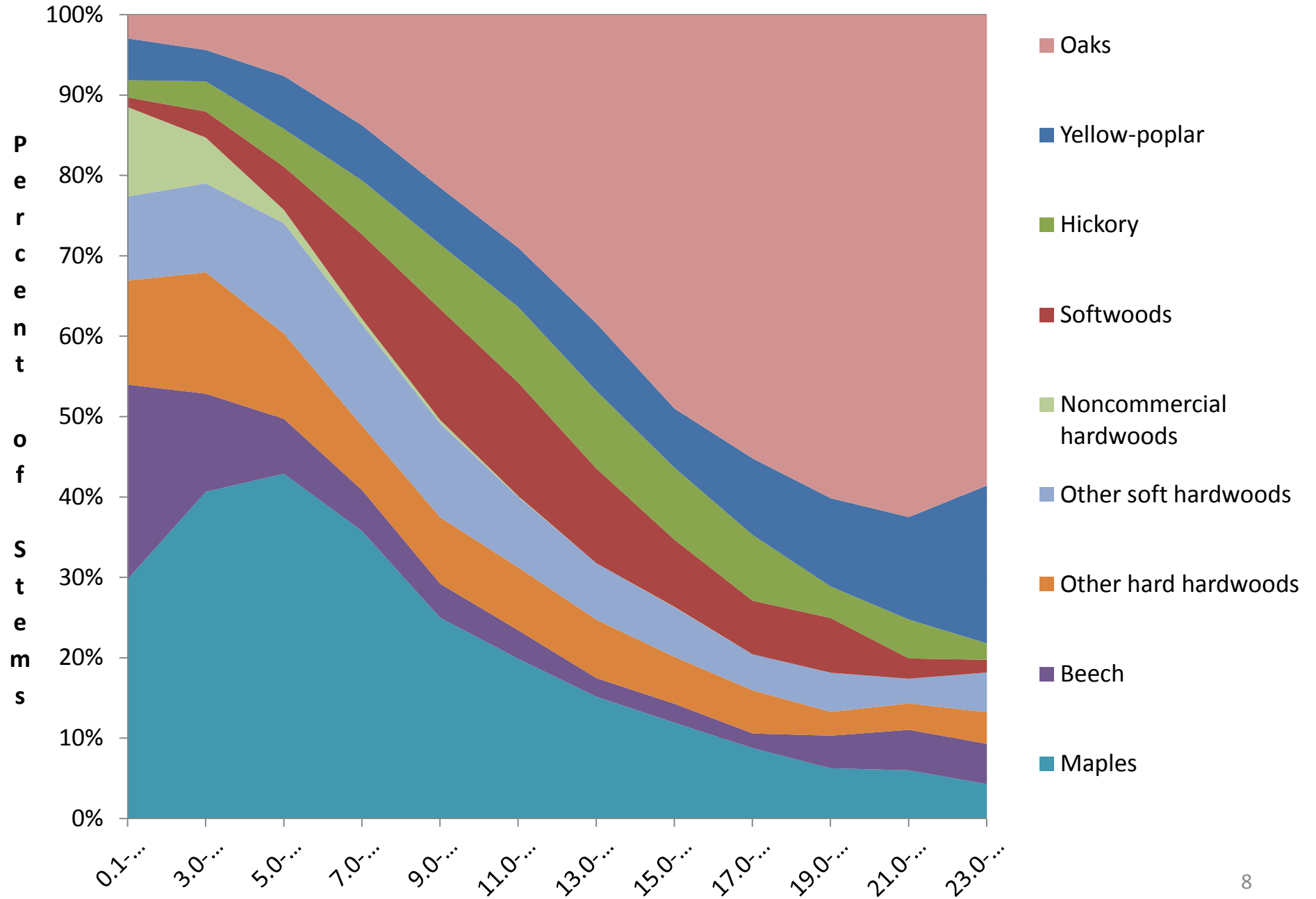
Forest Composition

- **Area**
- **Number of Trees**
- **Volume of All Live Trees (cubic feet)**
- **Volume of Sawtimber Trees (board feet)**
- **Grade of Sawtimber Trees**

Estimate: Total-Area of forestland(acres)

Forest Type	Stand-size	Large diameter	Medium diameter	Small diameter	Non-stocked
All	149,727	141,927	4,016	3,498	287
Mixed upland hardwoods	49,881	46,829	1,474	1,537	40
White oak / red oak / hickory	42,332	41,880	122	245	84
Chestnut oak	10,975	10,894	41	-	41
Pine / Hardwood	10,865	9,963	532	370	0
White oak	7,602	7,480	-	82	41
Yellow-poplar	5,192	4,371	580	241	-
Yellow-poplar / white oak / red oak	4,929	4,805	42	83	-
Chestnut oak / black oak / scarlet oak	3,930	3,930	-	-	-
Cherry / white ash / yellow-poplar	1,228	1,023	123	82	-
Sugar maple / beech / yellow birch	1,102	1,063	39	-	-
Other miscellaneous hardwood forest types	6,679	4,931	897	773	80
Miscellaneous softwood forest types	5,011	4,757	168	86	0

Number of Trees by Species and Diameter Class



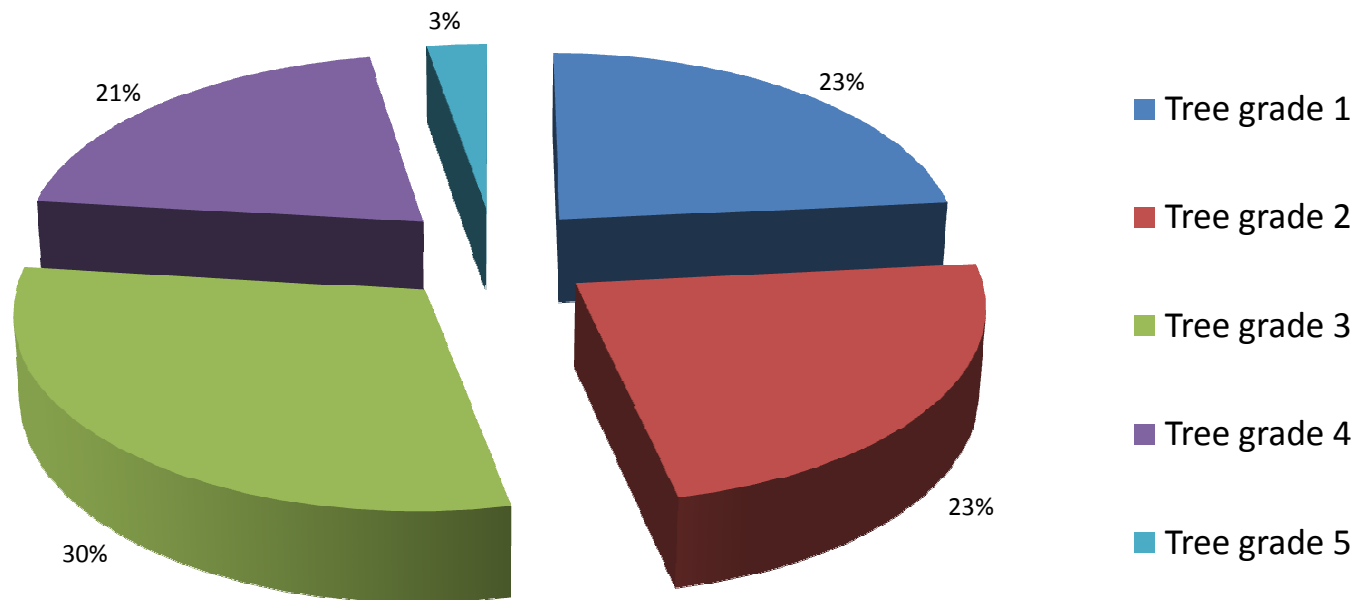
Estimate: Total-Volume of all live on forestland(cuft)

Species	Diameter class	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0 +
All	337,418,250	10,232,719	14,985,598	21,294,522	28,612,677	35,248,694	41,026,608	44,694,786	41,291,512	36,722,588	63,308,547
white oak	51,681,512	250,061	819,489	1,525,449	2,759,439	4,248,942	6,287,726	8,411,315	8,123,926	8,085,344	11,169,821
yellow-poplar	46,505,580	747,202	1,144,069	1,711,555	2,536,517	3,595,811	3,728,276	5,291,915	5,743,896	6,006,230	16,000,108
chestnut oak	39,898,037	223,871	538,552	1,464,586	2,926,545	4,675,465	6,586,239	7,061,324	7,186,921	5,087,208	4,147,325
black oak	31,917,744	108,983	192,276	476,429	722,116	1,784,494	2,794,962	4,150,453	5,005,238	5,094,785	11,588,008
sugar maple	29,723,711	3,391,987	4,046,967	3,823,013	4,055,063	3,831,578	3,447,181	2,646,218	2,149,687	1,449,637	882,378
redcedar and pine species	24,407,225	523,345	1,502,190	2,839,169	3,919,926	4,118,992	3,504,306	3,055,661	2,979,021	971,265	993,353
northern red oak	16,803,950	109,437	213,251	595,004	751,057	964,787	1,974,166	2,210,163	2,183,177	2,450,758	5,352,150
pignut hickory	13,966,990	276,698	617,125	1,164,813	1,674,215	1,931,825	2,675,373	2,511,619	1,226,285	929,921	959,116
red maple	13,943,890	1,301,293	1,607,325	1,766,169	1,838,288	1,678,809	1,559,944	1,393,156	530,332	762,430	1,506,144
American beech	12,870,195	684,401	761,606	879,585	1,003,902	843,866	985,673	859,592	1,734,422	1,898,292	3,218,856
other hardwood species	12,334,001	893,929	923,127	1,353,846	1,419,427	1,482,860	1,698,365	1,308,647	1,061,162	706,679	1,485,963
ash species	8,758,914	236,616	309,292	523,686	923,507	1,007,525	1,284,378	1,305,776	905,451	707,684	1,554,997
other hickories	8,451,149	197,322	385,040	585,080	1,161,161	1,679,155	1,293,093	1,472,443	516,274	977,624	183,957
American sycamore	6,039,584	77,678	130,938	229,503	258,382	630,157	730,923	792,054	707,806	463,151	2,018,991
sassafras	4,669,748	502,575	775,126	914,166	873,920	510,134	651,933	121,967	169,316	59,965	90,645
other oaks	5,477,396	88,369	208,663	290,657	565,844	775,759	895,280	975,940	376,131	530,971	769,782
black walnut	3,314,349	77,182	130,581	305,317	429,378	634,605	306,755	574,287	144,373	260,047	451,825
black cherry	2,902,322	153,935	212,685	417,344	328,479	393,291	231,013	334,647	321,948	135,256	373,724
elms	2,313,899	351,730	360,534	297,726	330,350	354,019	150,703	110,235	105,598	62,722	190,281
other maples	1,438,054	36,107	106,761	131,424	135,159	106,619	240,320	107,374	120,545	82,621	9 371,124

Estimate: Total-All live net sawtimber volume (bdft – Int 1/4)

Species	Diameter class	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0 +
All	1,378,946,740	12,973,621	132,876,929	167,276,116	196,271,668	214,237,073	196,558,897	171,780,378	286,972,059
white oak	222,038,141	-	13,455,655	20,315,629	29,717,551	39,001,882	36,420,584	35,717,440	47,409,400
yellow-poplar	218,056,478	-	12,654,898	18,079,230	19,119,168	27,446,148	30,016,452	30,697,753	80,042,829
chestnut oak	178,906,817	-	14,175,092	22,783,899	32,032,520	33,645,831	33,534,072	23,777,454	18,957,951
black oak	146,494,204	-	3,456,324	8,771,116	13,835,887	20,252,816	24,160,878	24,410,213	51,606,969
sugar maple	83,363,904	-	18,484,745	17,403,181	16,183,848	12,201,967	10,148,722	5,853,589	3,087,852
redcedar and pine species	76,493,589	-	3,566,471	4,801,000	9,853,366	10,871,997	10,785,927	11,978,355	24,636,473
northern red oak	61,741,592	-	11,572,940	10,469,794	11,986,349	7,367,876	6,920,916	4189356	9,234,362
pignut hickory	58,736,869	-	8,121,385	9,423,011	13,219,750	12,505,921	6,101,784	4,618,079	4,746,940
red maple	45,334,770	-	4,605,477	3,961,177	4,397,621	4,115,941	7,307,962	8,007,128	12,939,463
American beech	44,175,089	1,704,952	3,344,667	5,746,254	6,861,696	8,964,406	10,851,422	4,116,873	2,584,820
other hardwood species	40,475,534	5,365,158	8,529,832	10,294,988	7,315,253	4,467,378	3,043,485	395,020	1,064,420
ash species	37,978,562	-	7,334,696	7,014,769	6,766,100	5,584,434	2,316,048	3,302,955	5,659,560
other hickories	34,953,794	-	3,935,807	4,594,332	5,779,829	6,023,421	4,078,135	3,371,595	7,170,676
American sycamore	25,441,085	-	1,181,672	2,919,890	3,143,779	3,784,553	3,392,144	2,225,051	8,793,996
sassafras	25,145,970	5,903,512	6,883,211	4,332,768	3,119,016	1,883,819	1,194,956	408,646	1,420,041
other oaks	23,981,234	-	4,201,495	5,410,219	4,405,262	4,026,677	2,160,929	3,277,731	498,921
black walnut	23,000,856	-	2,589,427	3,592,070	4,236,238	4,752,379	1,813,921	2,497,405	3,519,418
black cherry	13,128,467	-	2,070,600	3,004,947	1,471,708	2,741,515	676,640	1,194,201	1,968,857
elms	11,026,136	-	1,434,702	2,696,628	1,901,798	3,089,202	355,248	1,146,316	402,242
other maples	8,473,648	-	1,277,837	1,661,214	924,929	1,508,911	1,278,671	595,219	1,226,868

Sawtimber Volume by Tree Grade



Change Attributes and Ancillary Data

- **Growth**
- **Removals**
- **Mortality**
- **Standing Dead Trees**
- **Trees with Cavities Present**

TOTAL ANNUAL GROWTH OF SAWTIMBER:

- USFS FIA estimates 40.4 MMBF or 259 BF/ac/yr.
- 2005 DNR Forestry system-wide inventory estimated 24.8 MMBF or 167 BF/acre/yr.

REMOVAL OR HARVEST OF SAWTIMBER:

- Previous 10 year average 9.5 MMBF
- Previous 5 year average 12.1 MMBF

Both of these removal or harvest estimates are well below either of the given growth estimates, suggesting that forests are being managed sustainably.

MORTALITY:

Using statewide estimates from FIA data, we expect average annual mortality (volume estimates) at about 1%/year of total live tree volume.

Estimate: Number of standing dead trees 5''' + dbh on forestland(trees)

Decay code	Diameter class	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0 +
All	1,712,846	593,305	359,095	271,100	141,725	125,964	69,821	72,077	38,363	14,857	26,538
1: All limbs and branches present	288,525	109,632	65,016	38,331	21,572	15,815	8,839	12,694	9,784	1,958	4,883
2: Few limbs and no fine branches	280,360	91,514	67,108	46,334	23,381	18,691	10,751	9,815	6,860	1,989	3,917
3: Only limb stubs present	530,113	181,126	92,698	81,852	43,407	54,119	25,578	19,825	15,771	6,896	8,841
4: Few or no limb stubs remain	483,487	163,616	104,588	78,917	44,486	29,484	20,737	24,792	5,948	3,001	7,918
5: No evidence of branches remain	130,361	47,417	29,686	25,666	8,880	7,855	3,917	4,950	-	1,013	979

Estimate: Total-Number of all live trees on forestland(trees)

Cavity Presence	Diameter class	0.1-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0 +
All	59,406,169	32,650,471	9,827,207	4,356,042	2,876,155	2,227,697	1,845,239	1,523,086	1,263,908	1,024,976	727,547	509,518	574,321
No Tree Cavity	58,212,375	32,650,471	9,827,207	4,086,106	2,673,644	2,073,841	1,692,076	1,432,116	1,164,036	955,732	686,978	464,157	506,010
Tree Cavity	1,193,793	-	-	269,936	202,511	153,856	153,163	90,970	99,871	69,244	40,569	45,361	14 68,311

Inventory Methods and Techniques

- **Quality Assurance/Quality Control**
- **Field Production Protocols**
- **Quality of the Estimates**
 - Sampling Error
 - Measurement Error
 - Prediction Error
 - Non-response Error
- **Data Management**

State Forest Timber Sale Information

1966-2013

Property	# Sales	# Acres	Dollars REC'D	Bd Ft Sold
Ferdinand	111	5,814	\$4,764,658	14,046,298
Pike	28	1,117	\$ 309,624	3,021,049
Martin	98	11,403	\$3,513,199	13,766,745
Harrison-Craw.	109	19,422	\$5,948,388	26,426,381
Greene-Sullivan	22	866	\$ 257,043	2,913,312
Salamonie/ Sloc.	13	699	\$ 166,885	697,513
Selmier	12	454	\$ 383,320	1,706,288
Yellowwood	304	19,521	\$ 6,832,472	34,946,044
Morgan-Monroe	302	28,734	\$ 9,757,997	45,572,431
Owen-Putman	107	9,174	\$ 2,449,224	12,847,640
Jackson-Wash.	185	12,116	\$ 3,760,111	23,462,148
Clark	106	11,623	\$ 3,223,259	20,788,605
Total	1397	120,943	\$41,366,186	200,194,454

Timber Sale Information 1966-2013

Ave. Volume/Ac Harvest	1,655
Average Sale Volume	143,303
Average Price Bd. Ft.	\$0.21
Average Sale Acreage	87

State Forest Properties

- Annual tree harvest per acre = 0.512
- Average number of trees per acre = 404
- Average number of trees cut from total # of all trees = 0.0012 trees/acre
- # of commercial size trees per acre ($>10''$) = 50
- % of commercial size trees cut of all trees = 1.0%
- Average tree volume of harvested trees = 186.66 board feet (20'' 2 -12' log tree)
- % of standing tree volume harvested = 1.0%
- % of land harvested annually = 3.0%